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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/709,212

04/21/2004

Qiming Li

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3211

23718 7590 06/05/2007  
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EXAMINER

WHITTINGTON, KENNETH

ART UNIT

PAPER NUMBER

2862

MAIL DATE

DELIVERY MODE

06/05/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/709,212

Applicant(s)

LI ET AL.

Examiner

Kenneth J. Whittington

Art Unit

2862

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-71 is/are pending in the application.
- 4a) Of the above claim(s) 40-71 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☒ Claim(s) 19-39 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |                                                                                                            |                                                                                         |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                           | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

**DETAILED ACTION**

***Response to Arguments***

Applicant's response filed April 15, 2007 is noted.

However, no arguments were made with respect to the rejection of claims 1-9 and thus no reply is deemed necessary. However, upon  
6 further review of the claims in view of Fanini, claims 10-18 are additionally rejected.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs  
of 35 U.S.C. 102 that form the basis for the rejections under  
12 this section made in this Office action:

A person shall be entitled to a patent unless -

18 (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the  
24 invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8 and 10-18 are rejected under 35 U.S.C. 102(e) as  
being anticipated by Fanini (US2004/0100263). Regarding claim  
1, Fanini discloses method and apparatus comprising:

disposing within a borehole a logging instrument equipped  
with at least first transmitter and receiver antennas spaced  
30 apart by a first distance, at least one of the first antennas

Art Unit: 2862

having a tilted magnetic dipole with respect to the longitudinal axis of the instrument, the antennas being oriented about the axis of the logging instrument such that the at least one tilted magnetic dipole corresponds to a first azimuthal angle (See Fanini FIG. 1 and see paragraphs 0018, 0019 and 0044-0056, note 6 there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z directions);

azimuthally-rotating the logging instrument within the borehole and while the logging instrument is rotating, activating the first transmitter antenna to transmit 12 electromagnetic energy into the formation; while the logging instrument is rotating (See paragraphs 0062-0077),

directionally measuring the first voltage signals associated with the transmitted electromagnetic energy using the first receiver antenna, as a function of the azimuthal orientation of the logging instrument, so as to determine the 18 azimuthal variation of the measured first voltage signals (See paragraph 0056-0077); and

fitting the azimuthal variation of the measured first voltage signals to approximate functions (See paragraphs 0067-0077).

Regarding claim 2, the fitting step is executed while the first voltage signals are being measured (See paragraphs 0064-0078, note that the data is fit for each azimuthal sector which is used to geo-steer, which would require real time calculations for steering).

6        Regarding claim 3, the fitting is stopped when convergence has been achieved (See paragraphs 0064-0077).

Regarding claim 4, the activating, measuring, and fitting steps are repeated to execute subsequent acquisition cycles (See paragraphs 0064-0078, note steps are repeated for each sector).

12        Regarding claims 5 and 6, the fitting functions are sinusoids defined by coupling components of the first transmitter antenna's magnetic dipole and first receiver antenna's orientation vectors and the coefficients of the fitting components are functions of earth formation parameters including at least one of resistivity of formation beds, location of the logging instrument, borehole deviation, azimuth  
18        angle at the location of the logging instrument, and a combination thereof (See paragraph 0056-0077).

Regarding claim 7, the fitting coefficients include constant, sine, cosine, double angle sin and double angle cosine terms that define an iterative fitting algorithm useful for

determining the azimuthal dependence of the directional measurements (See paragraph 0056).

Regarding claim 8, the iterative fitting algorithm is used for selected real-time directional measurements having utility in geo-steering (See paragraphs 0064-0078).

6        Regarding claim 10, Li discloses the logging instrument is further equipped with second transmitter antenna and receiver antennas spaced apart by the first distance, the second transmitter having a magnetic dipole whose tilt corresponds to the tilt of the first receiver antenna and the second receiver antenna having a magnetic dipole whose tilt corresponds to the  
12 tilt of the first transmitter antenna such that at least one of the second antennas has a tilted magnetic dipole, the second transmitter and receiver antennas being oriented about the axis of the logging instrument such that the at least one tilted magnetic dipole corresponds to a second azimuthal angle, and further comprising the steps of (See Fanini FIG. 1 and see  
18 paragraphs 0018, 0019 and 0044-0056, note there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z directions):

while the logging instrument is rotating, activating the second transmitter antenna to transmit electromagnetic energy into the formation (See paragraphs 0062-0077);

Art Unit: 2862

while the logging instrument is rotating, directionally measuring the second voltage signals associated with the transmitted electromagnetic energy using the second receiver antenna, as a function of the azimuthal orientation of the logging instrument, so as to determine the azimuthal variation of the measured second voltage signals (See paragraph 0056-0077);

fitting the azimuthal variation of the measured second voltage signals from the second receiver to approximate functions (See paragraphs 0067-0077).

Regarding claims 11 and 12, Li discloses the second azimuthal angle differs from the first azimuthal angle by substantially 90 degrees (See Fanini FIG. 1 and see paragraphs 0018, 0019 and 0044-0056, note there are a plurality of multi-component sensors comprising transmitters and receivers oriented at the x, y and z directions, note that the sensors are three axis transmitters and receivers at orthogonal axis, x, y and z, thus the first and second angles can be chosen to be 90 degrees relative to the tool axis, i.e., the x and y axes).

Regarding claim 13, Li discloses the fitting step is executed while the second voltage signals are being measured (See paragraphs 0067-0077).

Regarding claim 14, Li discloses the step of stopping the fitting when convergence criterion has been achieved (See paragraphs 0067-0077).

Regarding claim 15, Li discloses the activating, measuring, and fitting steps are repeated to execute subsequent acquisition  
6 cycles (See paragraphs 0064-0078, note steps are repeated for each sector).

Regarding claim 16, Li discloses the fitting functions are sinusoids defined by coupling components of the first  
transmitter antenna's magnetic dipoles and first receiver  
antenna's orientation vectors, and by coupling components of the  
12 second transmitter antenna's magnetic dipoles and second  
receiver antenna's orientation vectors (See paragraph 0056-  
0077).

Regarding claim 17, Li discloses the coefficients of the fitting components are functions of earth formation parameters such as resistivity of formation beds, location of the logging  
18 instrument, borehole deviation, and azimuth angle at the location of the logging instrument (See paragraph 0056-0077).

Regarding claim 18, Li discloses the fitting coefficients include constant, sine, cosine, double angle sin and double angle cosine terms that define an iterative fitting algorithm



useful for determining the azimuthal dependence of the  
directional measurements (See paragraph 0056).

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not  
6 included in this action can be found in a prior Office action.

Claim 9 is rejected under 35 U.S.C. 103(a) as being  
unpatentable over Fanini in view of Minerbo et al. (US  
6,304,086), hereinafter Minerbo. Regarding this claim, Fanini  
teaches the features noted above except for the use of a Fourier  
transform. Minerbo teaches use of a Fourier transform in  
12 induction logging applications (See Minerbo col. 5, line 57 to  
col. 15, line 38). It would have been obvious to use a Fourier  
transform in the processing of Fanini. One having ordinary  
skill in the art would have been motivated to do so to reduce  
the complexity of equations to a usable form as noted by Minerbo  
at col. 7, lines 45-49 and further it is well known in the art  
18 to use a Fourier transform to derive a set of equations with  
coefficients representing desired characteristics.

***Allowable Subject Matter***

Claims 19-39 are objected to as being dependent upon a  
rejected base claim, but would be allowable if rewritten in

Art Unit: 2862

independent form including all of the limitations of the base claim and any intervening claims.

Regarding claims 19, 20, 24, 25 and 28, the prior art does not show or teach calculating the phase shift and attenuation and the calculating as recited in the claims and in combination  
6 with the other features of the claims.

Regarding claims 21-23, the prior art does not show or teach characterizing the noise as recited in the claims and in combination with the other features of the claims.

Regarding claims 26 and 27, the prior art does not show or teach determining the constant and first harmonic coefficients  
12 as recited in the claims and in combination with the other features of the claims.

Regarding claims 29-39, the prior art does not show or teach the particular iterative fitting algorithm as recited in the claims and in combination with the other features of the claims.

18

### ***Conclusion***

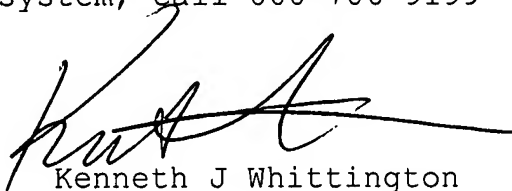
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Whittington whose telephone number is (571) 272-2264. The

Art Unit: 2862

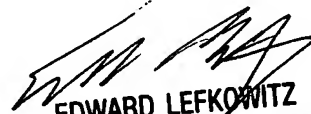
examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Kenneth J Whittington  
Examiner  
Art Unit 2862

kjw

  
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SUPERVISORY PATENT EXAMINER  
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